

1. A method of operating a process analysis system to analyze a process, the method comprising:
 - in a plurality of sensors, monitoring the process to generate sensor signals;
 - in a processing system, processing the sensor signals to detect a deviation from a baseline for the process;
 - 5 in the processing system, generating a process vector for the deviation in response to detecting the deviation; and
 - in the processing system, comparing the process vector to a plurality of library vectors to classify the deviation.
- 10 2. The method of claim 1 wherein the process comprises a system that supplies water.
3. The method of claim 2 wherein the sensor signals indicate pH, conductivity, turbidity, chlorine, and total organic carbon of the water.
- 15 4. The method of claim 2 wherein the classified deviation comprises a contaminant in the water.
5. The method of claim 2 further comprising signaling a control system to operate a valve in response to classifying the deviation as a contaminant in the water.
- 20 6. The method of claim 2 further comprising signaling a control system to add a marker to the water in response to classifying the deviation as a contaminant in the water.
7. The method of claim 6 wherein the marker comprises a colorant.

8. The method of claim 2 further comprising signaling a control system to perform a treatment on the water in response to classifying the deviation as a contaminant in the water.

5 9. The method of claim 8 wherein the treatment comprises adding a disinfectant to the water.

10 10. The method of claim 8 wherein the treatment comprises adding chlorine to the water.

11. The method of claim 8 wherein the treatment comprises exposing the water to ultraviolet
10 radiation.

12. The method of claim 1 wherein processing the sensor signals to detect the deviation from the baseline comprises processing the sensor signals to produce a single variable and comparing the single variable to a threshold.

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13. The method of claim 1 wherein generating the process vector for the deviation comprises generating a unit vector.

20 14. The method of claim 1 wherein comparing the process vector to the library vectors comprises comparing an angle between the process vector and one of the library vectors to a threshold.

15. The method of claim 1 wherein the library vectors are associated with abnormal operations and classifying the deviation comprises identifying one of the abnormal operations that is associated with one of the library vectors that matches the process vector.
- 5 16. The method of claim 1 further comprising, in response to an unknown classification, storing the process vector as a new one of the library vectors and associating an abnormal operation with the new library vector.

17. A process analysis system comprising:

a plurality of sensors configured to monitor a process to generate sensor signals; and

a processing system configured to process the sensor signals to detect a deviation from a baseline for the process, generate a process vector for the deviation in response to detecting the deviation, and compare the process vector to a plurality of library vectors to classify the deviation.

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18. The process analysis system of claim 17 wherein the process comprises a system that supplies water.

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19. The process analysis system of claim 18 wherein the sensor signals indicate pH, conductivity, turbidity, chlorine, and total organic carbon of the water.

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20. The process analysis system of claim 18 wherein the classified deviation comprises a contaminant in the water.

21. The process analysis system of claim 18 wherein the processing system is configured to signal a control system to operate a valve in response to classifying the deviation as a contaminant in the water.

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22. The process analysis system of claim 18 wherein the processing system is configured to signal a control system to add a marker to the water in response to classifying the deviation as a contaminant in the water.

23. The process analysis system of claim 22 wherein the marker comprises a colorant.
24. The process analysis system of claim 18 wherein the processing system is configured to
5 signal a control system to perform a treatment on the water in response to classifying the deviation as a contaminant in the water.

25. The process analysis system of claim 24 wherein the treatment comprises adding a disinfectant to the water.

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26. The process analysis system of claim 24 wherein the treatment comprises adding chlorine to the water.

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27. The process analysis system of claim 24 wherein the treatment comprises exposing the water to ultraviolet radiation.

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28. The process analysis system of claim 17 wherein the processing system is configured to process the sensor signals to produce a single variable and compare the single variable to a threshold to detect the deviation from the baseline.

29. The process analysis system of claim 17 wherein the process vector comprises a unit vector.

30. The process analysis system of claim 17 wherein the processing system is configured to compare an angle between the process vector and one of the library vectors to a threshold.

5 31. The process analysis system of claim 17 wherein the library vectors are associated with abnormal operations and the processing system is configured to identify one of the abnormal operations that is associated with one of the library vectors that matches the process vector to classify the deviation.

10 32. The process analysis system of claim 17 wherein the processing system is configured to store the process vector as a new one of the library vectors and associate an abnormal operation with the new library vector in response to an unknown classification.